Strategic code change: offshore transmission, storage, and the road to 2025

22nd June 2021

NGESO Markets Forum

nationalgridESO

Introduction

Update since March stakeholder event

- Discussion summary and webinar recording available on website
- Strategic code change roadmap updated through ongoing stakeholder engagement

Purpose

Today's session aims to continue building shared awareness and understanding of:

- How strategic programmes across industry may impact codes and charging on the road to net zero
- Consider cross-code interdependencies and other interactions between reforms and change programmes

The discussion will feed into relevant programmes and reforms in ESO and across industry.

Agenda

- Update on 2025 codes roadmap and overview of selected programmes of work
- Offshore Transmission Network Review deep dive
- Storage deep dive

Codes, charging and frameworks are on the critical path to net zero

Whole System

By 2030 we could see decentralised generation providing 73-89% of peak demand.

We therefore need to:

- ensure coordination and consistency across codes
- increase visibility and engagement of connected assets

Competition everywhere

By 2030 we could see over a third of consumers providing flexibility services, increasing to over 80% by 2050.

We therefore need:

- reduced barriers to entry & improved access to information
- enabling market access for more participants.

Carbon free operation

Annual renewable generation could increase from 41% today, to 80% by 2030 and 96% by 2050.

We therefore need to:

- support new markets and services
- enable increased system flexibility
- enable increased interconnection.

Scaling up low carbon infrastructure

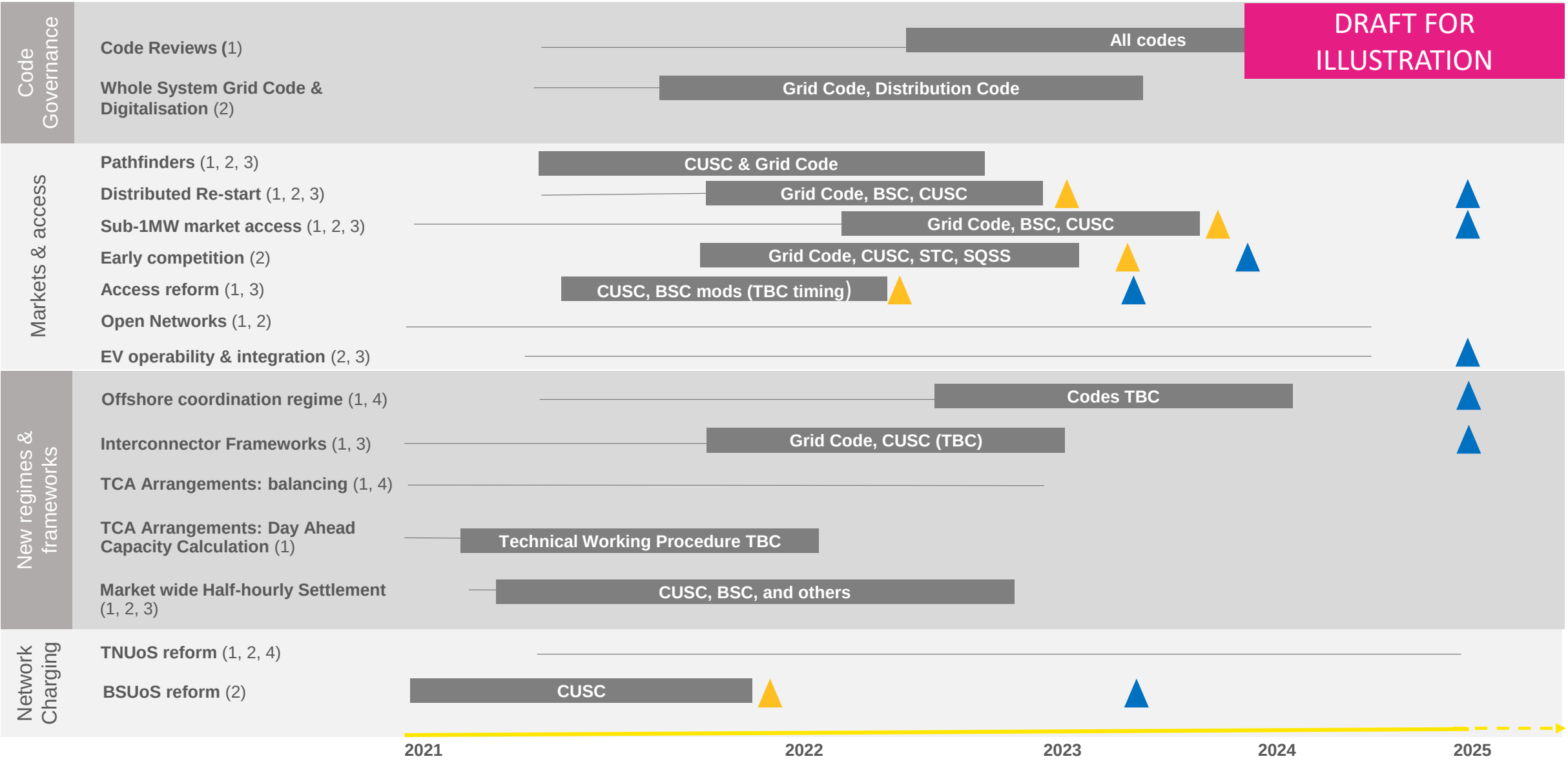
The electrification of transport and heat are expected to drive increases in:

- total GB generation capacity by 150-200% by 2050
- offshore wind to 40 GW by 2030 and to over 80GW by 2050.

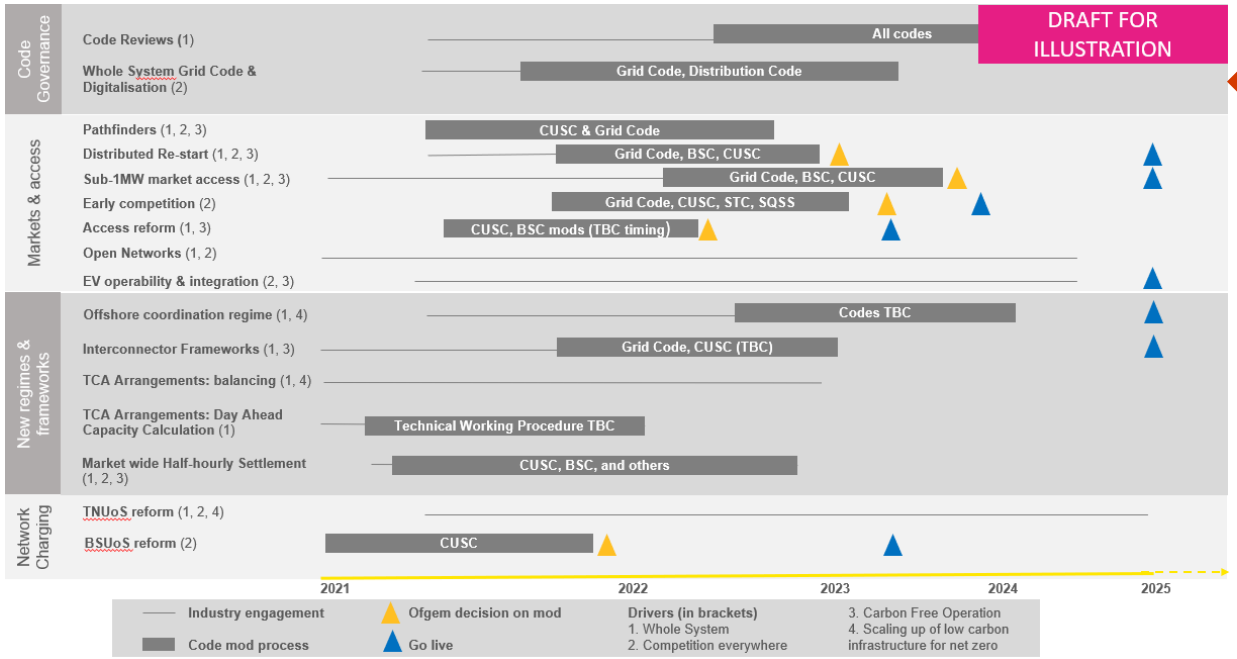
We therefore need:

- new connections & infrastructure arrangements
- efficient commercial signals in network charging.

Strategic programmes will drive increasingly complex and interdependent change



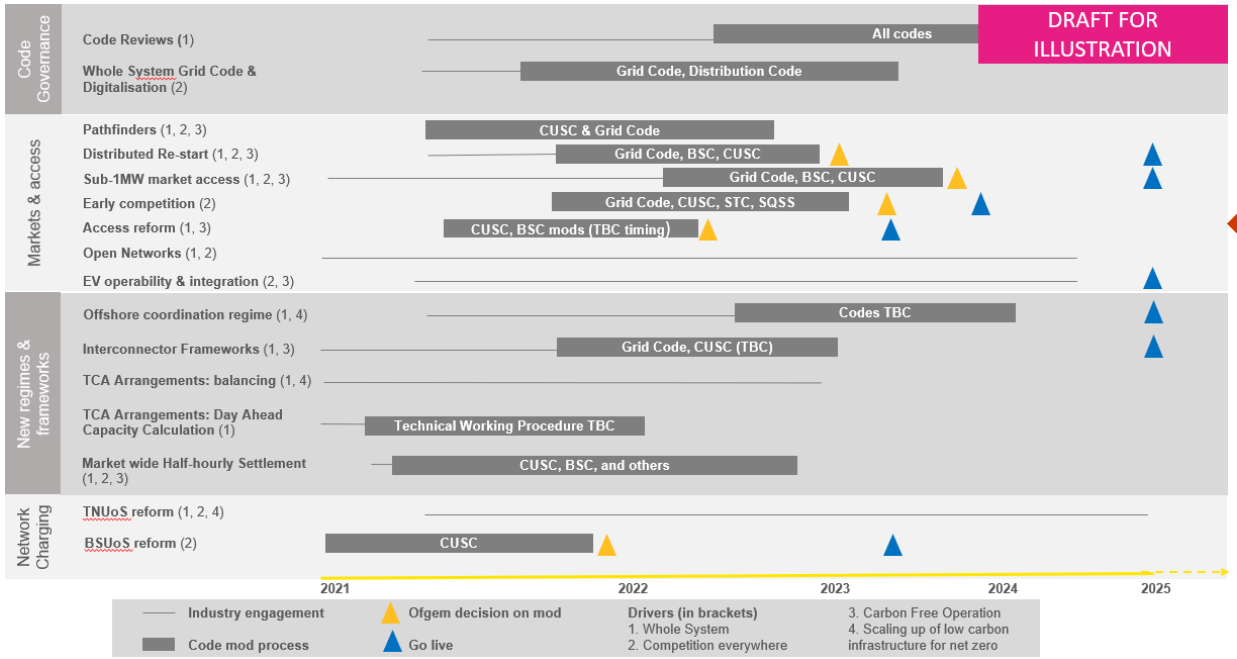
Focus on: whole system Grid Code & digitalisation



Next steps & key milestones:

- RIIO2 ambition – delivery of a 'whole system' digitalised Grid Code
- Year 1 of the plan in 2021 – engagement with stakeholders to consider scope and how to deliver
- Two elements to the deliverable:
  - 'Whole system' code alignment
  - Digitalisation

Focus on: access reform & review of large generator thresholds



Next steps & key milestones:

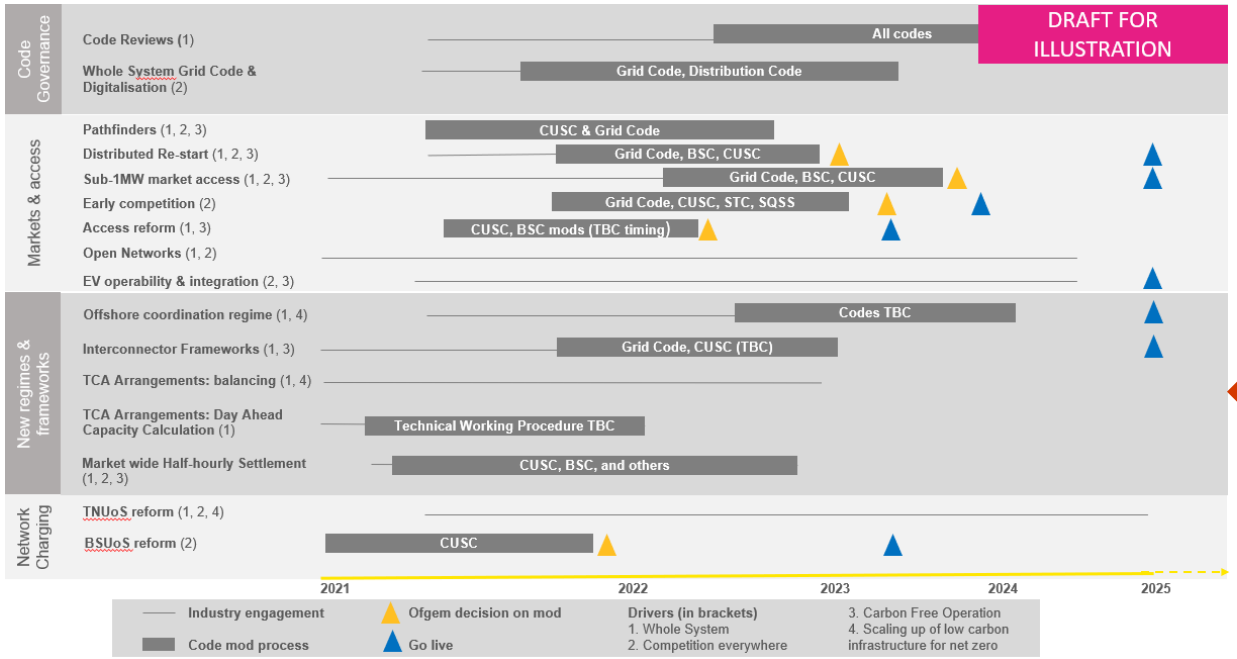
SCR:

- Ofgem minded to decision on Access SCR expected June ‘21
- Modifications will be raised following Ofgem’s final determinations on the Access SCR

Review of generator thresholds

- Raised by SSE Generation as Grid Code modification GC0117
- Being progressed through Grid Code workgroup
- Proposal to amend the threshold to a single harmonised value across all GB TO areas
- Could result in increase or decrease in BM participation

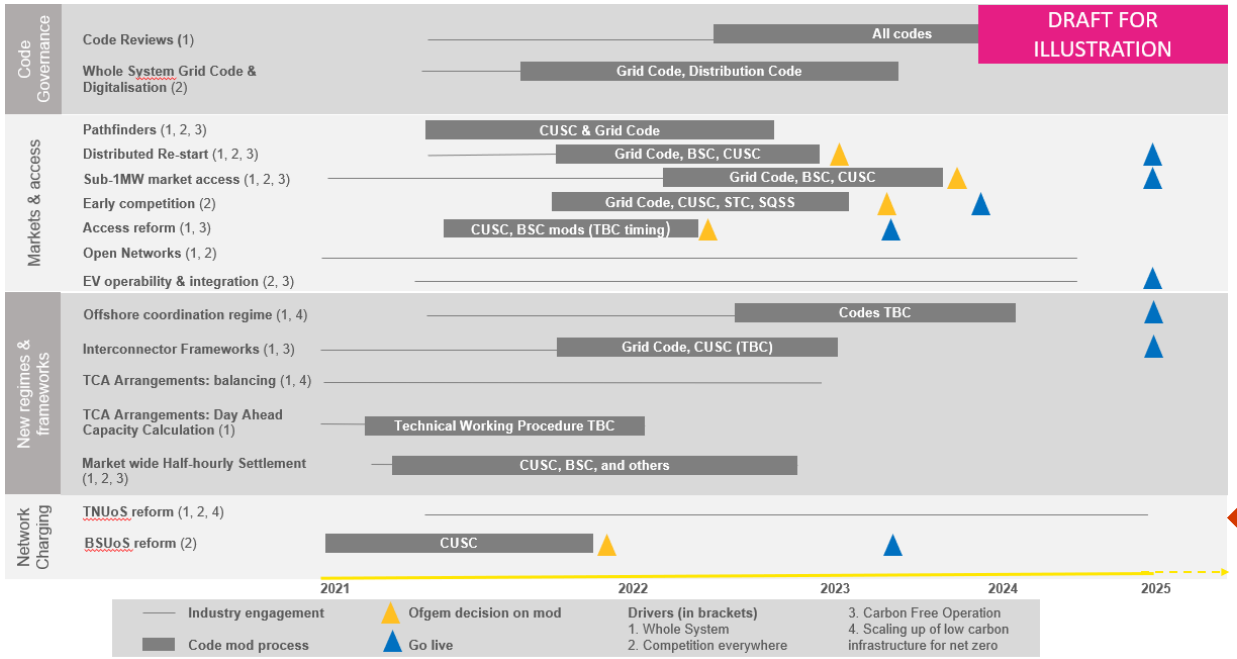
Focus on: Trade and Cooperation Agreement



Next steps & key milestones:

- 3 key deliverables: day-ahead capacity calculation; wider timeframe capacity calculations, and; cross border balancing
- first workgroup has taken place with UK TSOs, EU TSOs & ENTSOE in attendance. Currently developing a combined view of the feasibility of the timeline, and an understanding of the requirements for the Technical Working Procedure
- wider capacity calculation and cross-border balancing technical procedures are currently in the assessment phase. No firm dates have been provided, however it would be desirable to have an implementation plan of a selected option in place for April 2022.

Focus on: TNUoS reform



Next steps & key milestones:

- Delivery of follow up to TCR modifications (complex sites and compliance with the Limiting Regulation)
- Follow on modifications for review of the Expansion Constant and TCR process modifications (billing/credit)
- Co-location and other issues around new types of connections

A plan is needed for medium / long term reform

- This needs to focus on further change following the review of the expansion constant (for example rezoning, offshore developments)
- Needs to align with any development through the A&FLC SCR and consider reforms elsewhere (eg Ofgem's focus on full chain flexibility, wider market reforms etc)

Discussion

- Are there any areas you would like to discuss in more detail?
- How / where is the best place for that discussion?

Offshore Co-ordination

Mike Oxenham
Offshore Co-ordination Team

nationalgridESO

Offshore Co-ordination Phase 1

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Phase 1 Key Findings

£6 billion (18%) potential savings by 2050 if integration starts from 2025

The number of assets could be reduced by 50% creating significant environmental & social benefits

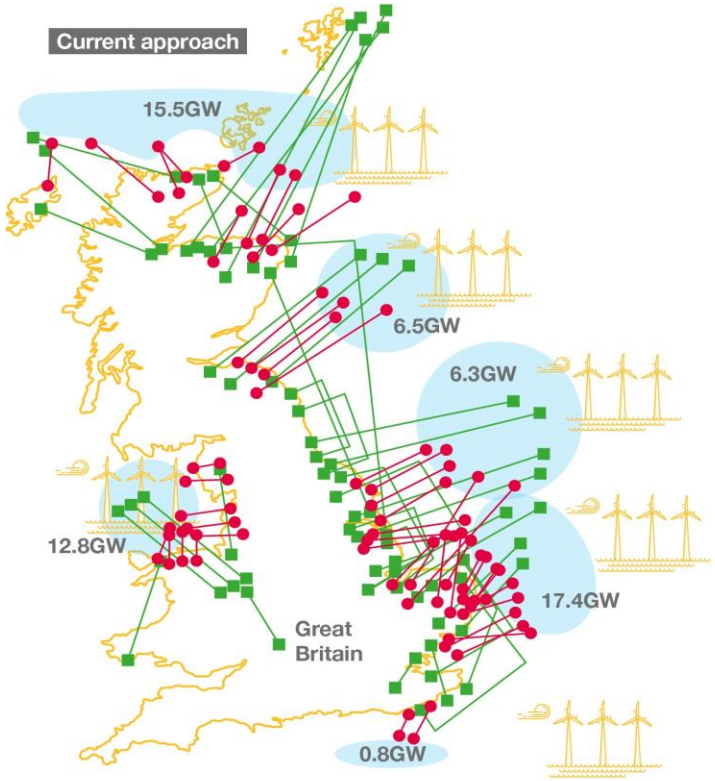
Benefits are reduced the later integration begins – by half if integration starts in 2030.

Flexibility is needed to deliver projects in train without putting their delivery and the 2030 offshore wind target at risk

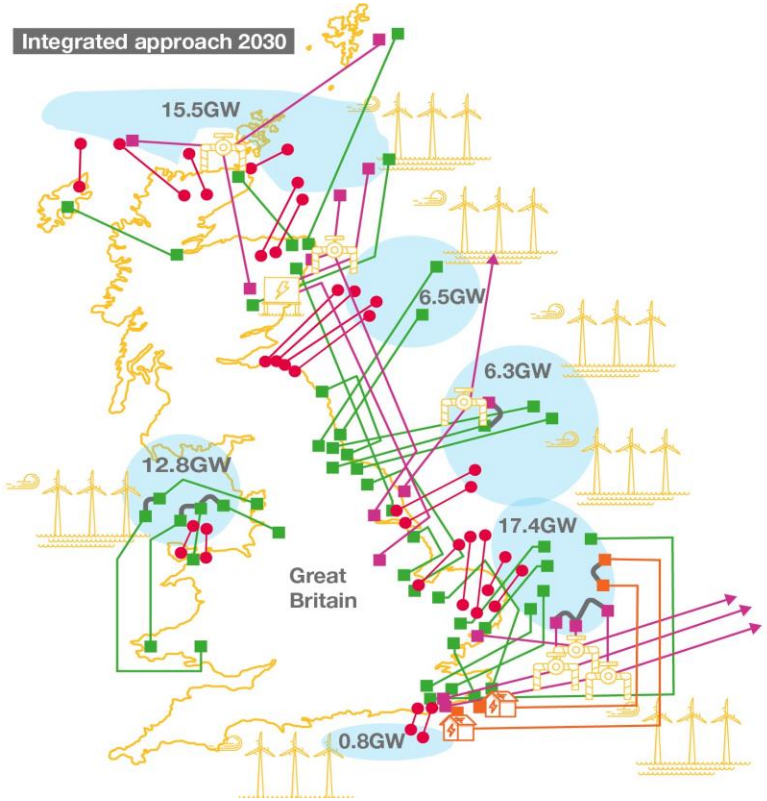
Support for commercial deployment is needed to deliver all of the required technology

Additional onshore infrastructure is required to connect wind, however integration can minimise the overall increase in infrastructure

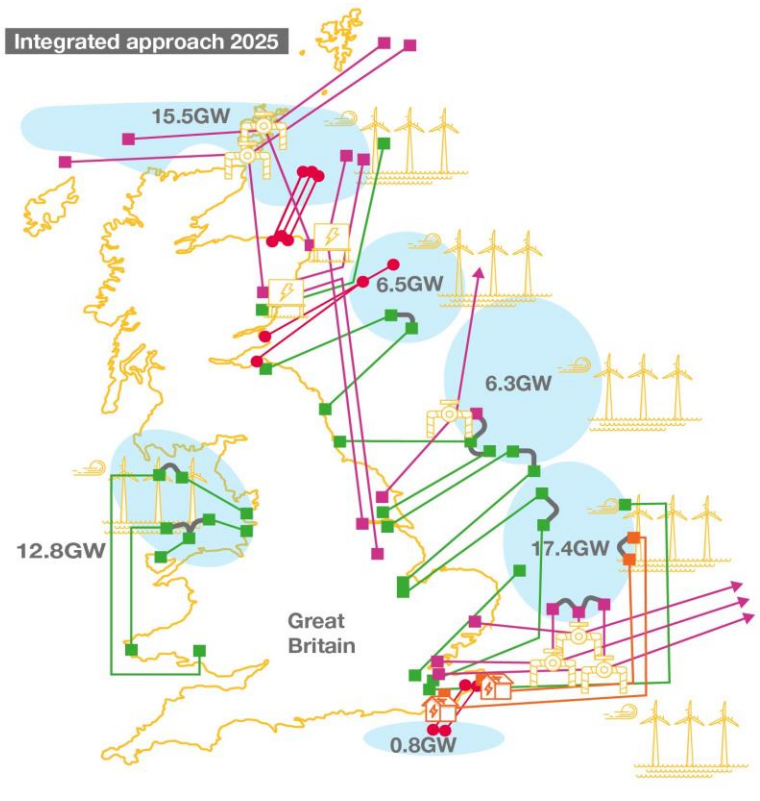
How it could look in 2050



Capex Cost: £29 billion
Total Assets: 330
Total Landing points: 105



Capex Cost: £27 billion (-8%)
Total Assets: 40% reduction
Total Landing points: 60



Capex Cost: £23 billion (-18%)
Total Assets: 70% reduction
Total Landing points: 30

Offshore Co-ordination Phase 2

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Phase 2 Overview

We are working with stakeholders, including the other project partners, within the BEIS-led Offshore Transmission Network Review.

This is a review into the way that the offshore transmission network is designed and delivered, consistent with the ambition to deliver net zero emissions by 2050.

We have structured Phase 2 of our ongoing Offshore Co-ordination Project to align with the Offshore Transmission Network Review structure.

Early Opportunities

We are working with opt-in developers to explore potential opportunities for co-ordination of in-flight projects.

Pathway to 2030

We are starting to explore holistic network design opportunities to help facilitate the achievement of 40GWs of offshore wind by 2030.

Enduring Regime

We are considering our views in relation to what the enduring offshore regime might look like in future.

Group Insights

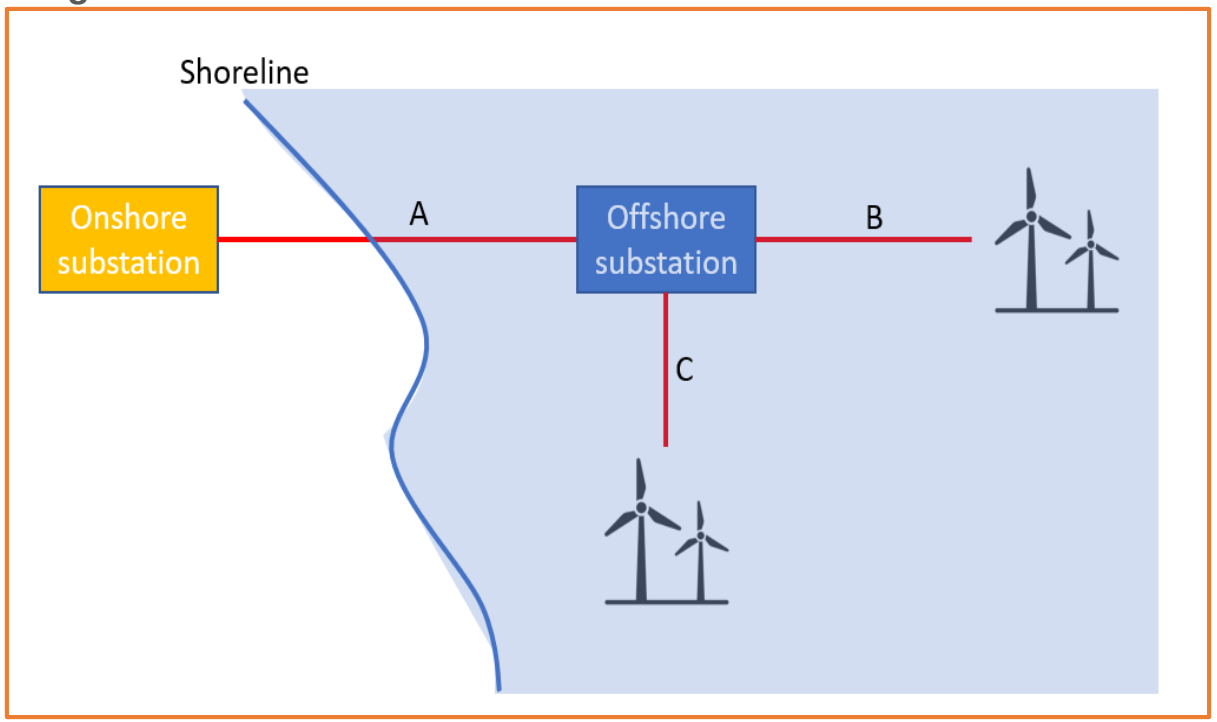
We will briefly provide you with an overview of an illustrative offshore network configuration that depicts a greater level of offshore co-ordination when compared to a radial connection.

We would like your views on the potential code and standard barriers and enablers in respect of such network configurations.

Illustrative Model 1

Connecting multiple offshore wind farms, owned by separate entities, to the same OFTO substation and cable.

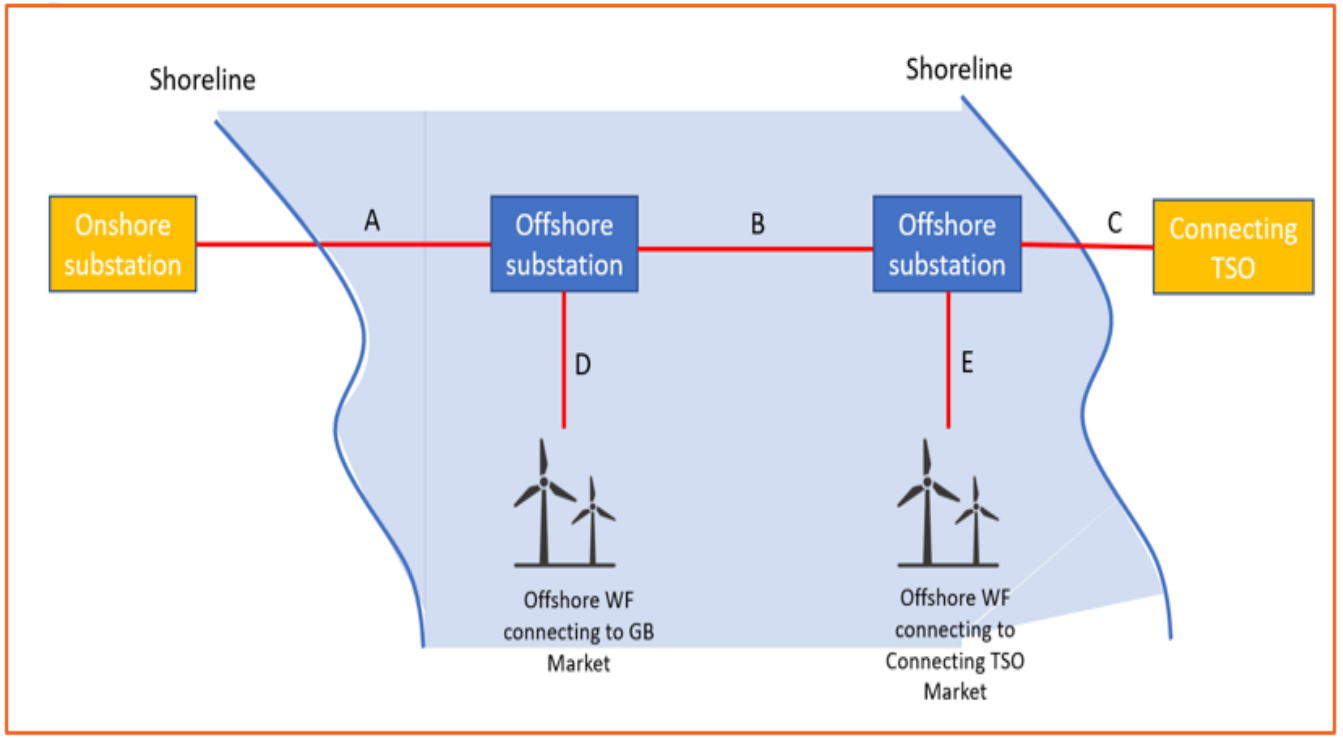
Diagram 1: Shared OFTO



Illustrative Model 2

Connecting offshore wind farms to a HVDC cable connecting between two synchronous areas/markets.

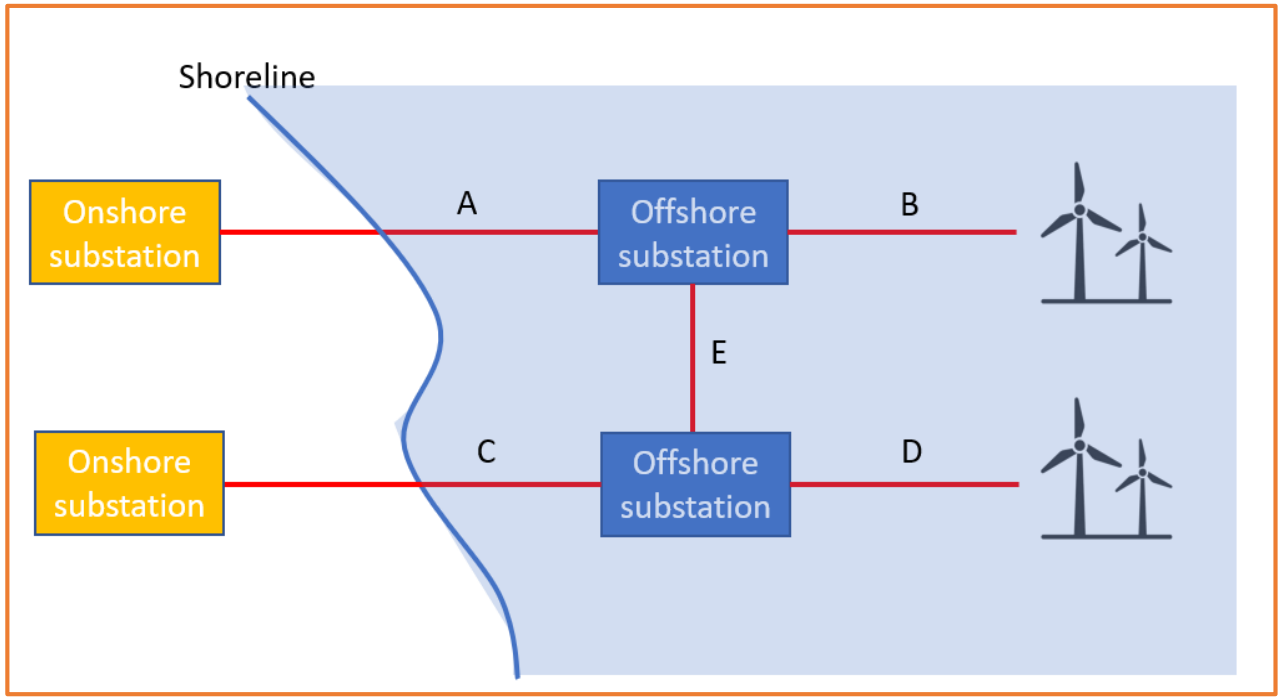
Diagram 2: MPI – two markets



Illustrative Model 3

An additional cable (link ‘E’) connecting between two offshore substations.

Diagram 3: OFTO Integrated Network



We would like your views…

Q1. Based on the insights just now how do you think such changes should be made to the codes and standards at the appropriate time in future e.g. Open Governance, an SCR, etc?

We would like your views…

Q2. How would you like to be engaged prior to any OTNR driven changes to codes and standards in future?

Further information

If you would like to know more about the Offshore Transmission Network Review and Offshore Coordination:

https://www.gov.uk/government/groups/offshore-transmission-network-review

https://www.nationalgrideso.com/future-energy/projects/offshore-coordination-project

Contact us at: box.OffshoreCoord@nationalgridESO.com

Storage deep dive

Antony Johnson, Technical Code Change

Nicola White, Commercial Code Change

Storage

- Has had increasing focus over the last few years as the technology has become more firmly established in the market
- Promotes greater flexibility and the opportunity to participate in a number of Balancing Services (eg Frequency Response, Constraint Management, Grid Forming etc)
- Can add optionality as co-located sites - either new or existing. For example:
    - storage can play a role in integrating intermittent generation
    - contributing to balancing services
- A number of developments have taken, and are taking, place in the storage space
    - from a licensing perspective storage is treated as Generation
    - technical requirements for Storage were implemented into the Grid Code in June 2020 (GC0096) and the requirements are consistent with Generation
    - some technologies are excluded from these requirements (eg Synchronous Compensators, Regenerative Braking - work continues to address these issues)

What is storage?

Electricity Storage, for licensing purposes, should be treated as electricity generation

Condition E1 of the electricity generation licence is only applicable to electricity storage providers

The definition of '**electricity storage**' and '**electricity storage facility**' is provided in the electricity generation licence

Electricity Storage is the conversion of electrical energy into a form of energy which can be stored, the storing of that energy, and the subsequent reconversion of that energy back into electrical energy

Electricity Storage Facility means a facility where Electricity Storage occurs

The concept of electricity storage is technology neutral, future-proof and does not inhibit innovation

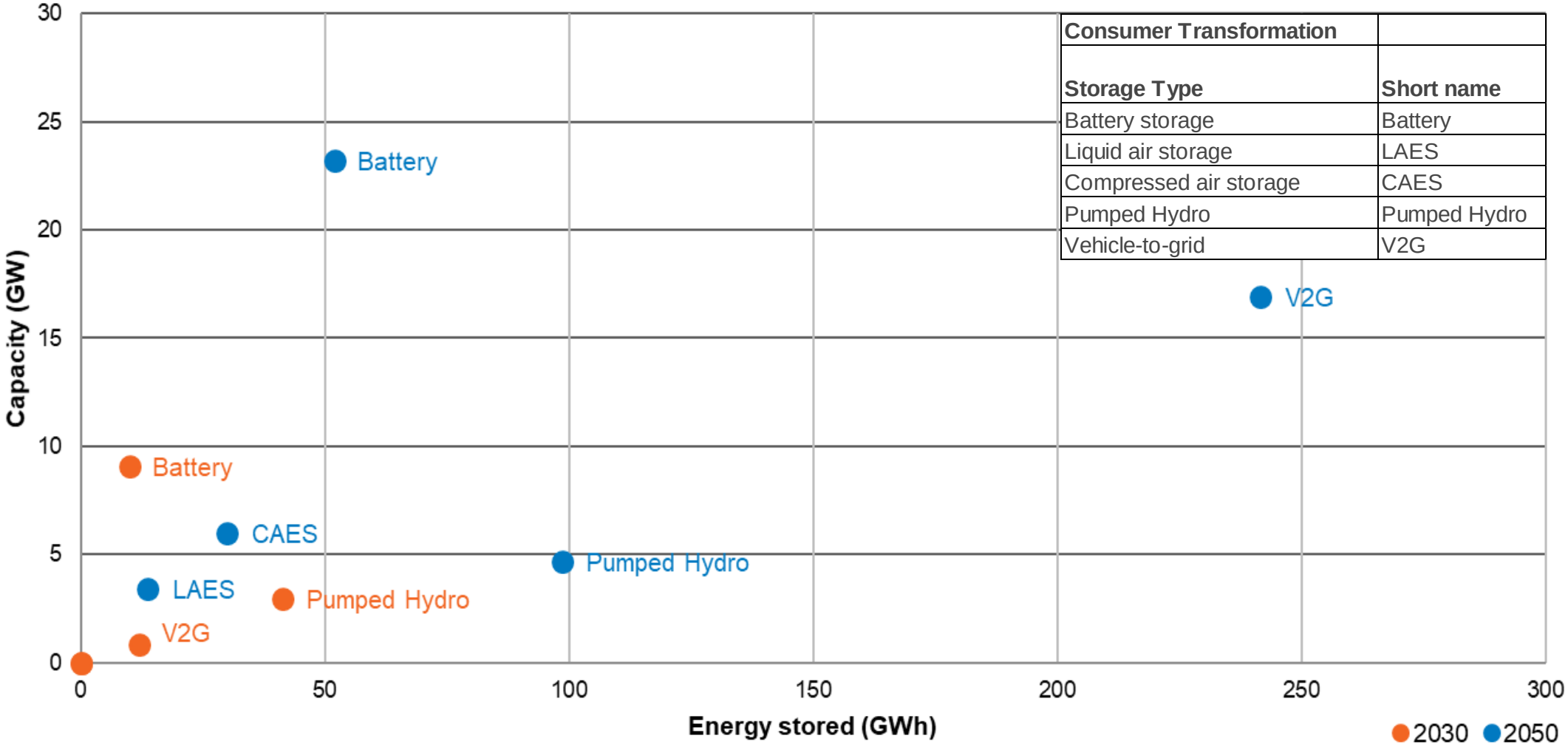
'Short' & 'Long' Storage

- The majority of large-scale batteries are be able to provide power for 30-90 minutes and are referred to as ‘short duration’ storage.

- ‘Long-duration’ energy storage technologies provide storage capabilities for more than 4 hours and helps to manage variation in generation, such as extended periods of low wind.

- ‘Long-duration’ storage puts the focus on the amount of energy that can be stored and expectations in terms of the function it can provide for cost-effective solutions, such examples are:
    - for usage during peak demand hours or base load;
    - to be able to provide a full day of renewable power as baseload;
    - to provide eight hours of duration.

Power and energy outputs of electricity storage types: 2030 and 2050



Consumer Transformation	
Storage Type	**Short name**
Battery storage	Battery
Liquid air storage	LAES
Compressed air storage	CAES
Pumped Hydro	Pumped Hydro
Vehicle-to-grid	V2G

Challenges & Wider Changes

Recent changes

- **Final Consumption Levies** (FCLs) payments, if you are a licensed storage provider, then you are exempt from paying FCLs

Current modifications

- Disproportionate charging regime with **potential for 'double counting'** (import & export) of the supply of electricity to the end consumer
- **TCR/SCR embedded benefits**, a large proportion of charges should be paid by final demand only excluding all types of generation (including stand-alone storage) from residual network charges

Ongoing issues being discussed

- **Distributed generators**, including storage, might pay TNUoS
- Treatment of **Synchronous Compensators** / zero-MW connections

Further information

CUSC, CMP280, Final Modification Report, Oct-19
https://www.nationalgrideso.com/industry-information/codes/connection-and-use-system-code-cusc-old/modifications/cmp280-creation

Targeted Charging Review: Decision and Impact Assessment | Ofgem, Dec-19
https://www.ofgem.gov.uk/publications-and-updates/targeted-charging-review-decision-and-impact-assessment

CUSC, CMP281, Ofgem decision letter, May-20
https://www.ofgem.gov.uk/system/files/docs/2020/05/cmp281_d.pdf

DCUSA, DCP358 & DCP360, Ofgem decision letter, Sep-20
https://www.dcusa.co.uk/wp-content/uploads/2020/09/DCPs-358-and-360-Authority-Decision.pdf

Ofgem decision, regulatory framework, electricity storage: electricity generation licence, Feb-21
https://www.ofgem.gov.uk/ofgem-publications/166793

Distribution Code, DCRP/20/06/PC - Storage Modifications, Apr-21
http://www.dcode.org.uk/consultations/closed-consultations/

Links to ESO Projects

Webinar summary of a 5-point plan to manage network constraints
https://www.nationalgrideso.com/news/our-5-point-plan-manage-constraints-system

Technical feasibility assessment on how energy storage could help manage constraints
https://www.nationalgrideso.com/news/how-could-energy-storage-help-manage-constraints

Reserve from storage in the BM
https://data.nationalgrideso.com/plans-reports-analysis/covid-19-preparedness-materials/r/reserve_from_storage_in_the_bm_-_phase_3_trial_review

Pathfinder projects, each designed to solve specific problems in the system
https://www.nationalgrideso.com/future-of-energy/projects/pathfinders

We would like your views…

Q1 What further changes in the codes are needed to facilitate storage?

Q2 What blockers are needed to be addressed to promote storage?

Next steps

We will summarise and share today's discussion.

Two last questions:

Q1 Did you find today's session valuable?

Q2 What would you like to see us focus on next?

Contact us:

Via your account manager, or email:

commercial.operation@nationalgrideso.com

Appendix

Update on 2025 Codes Roadmap: Discussion

Discussion, questions, and ESO response

Code governance: there is a need for efficient and timely change as well as digitalising all codes

The ESO agrees that timely and efficient change is required for code modifications. This is something we would like to learn from the TCR process and apply as the Access SCR progresses.

We are starting code digitalisation with the grid code, and share the aspiration for this across the codes

TNUoS: arrangements for co-location and need to align DUoS and TNUoS methodologies

We agree that the arrangements for co-located sites need to be clarified and raised a modification (CMP316) in April 2019 to address this. The alignment of methodologies was set out as a key part of our proposed DSO vision and we believe that doing so could simplify charging for new parties.

Enabling aggregation of residential flexibility

We are supportive of any developments that reduce barriers to entry and facilitate demand side assets into our balancing services markets, without reducing the quality of service to our control room

Benefits case of benefits of various projects / services and how these benefits are shared

We regularly consult on how we procure our various services (further information can be found here) and are exploring new approaches to how services can compete against network investment through our longer term Pathfinder projects.

Locational marginal pricing keeps being mentioned e.g. in the Policy Exchange and Energy System Catapult papers, CMA, Ofgem. How does that fit in with charging?

Locational signals are an important element of driving efficient investment in our energy system, and we are considering how these signals are best designed in our Net Zero Market Design project. We believe that this work should align with any future TNUoS reform to ensure that the market receives coherent and efficient signals.

Update on 2025 Codes Roadmap: Discussion

How to include small-scale (domestic) batteries and EV infrastructure to leverage flexibility from EV chargers (especially HV / forecourt type chargers) and EV batteries?

Flexibility from residential consumers will play an increasingly important role as our system continues to decarbonise. There are many projects underway to enable this, including examples such as our innovative CrowdFlex collaboration with Octopus Energy and SSEN, and the rollout of market wide half hourly settlement. Each step highlights new challenges and opportunities, and we expect codes and charging arrangements to need to change in response.

How do you avoid code changes taking 3-5 years (because ESO deprioritises them in favour of TCR and EU change)?

We appreciate that it can be frustrating that not all code modifications can be administered at the same time. In the short term, the ESO Code Administrator is continuing with incremental changes such as increasing resource and improving the change process. We are also conscious of feedback from industry that market participants also require prioritisation of modifications as they have their own resourcing challenges. To this end, our longer term initiatives include larger scale changes such as Digitalisation of the Grid Code which will make the codes more accessible and help to quicken the pace of change by reducing the time and effort involved in changes.

Energy Codes Review. What's happening?

Engagement on the ECR is ongoing with a further Ofgem /BEIS consultation planned for summer 2021. We have delivered 'quick win' improvements to Grid Code/CUSC code governance and are currently developing proposals for further 'no regrets' options for code consolidation to consider with stakeholders ahead of the longer term implementation of the review. The Whole System Grid Code project is one opportunity to potentially do this, with potential for quick wins as well as informing the ECR outcome.

Cost reflectivity of TNUoS is vital to ensure net zero plant is located in the cheapest place in whole system cost terms, efficient development, but could it be fixed 5 years at a time ?

The future of TNUoS is an important discussion that needs to be had openly across industry. It is a complex issue, and this question highlights the tension between providing certainty to the market and allowing for the methodology to respond to a rapidly evolving market through mechanisms such as open governance.

Update on 2025 Codes Roadmap: Discussion

Do you see a move away from the locational / cost reflective aspect of charges for TNUoS ?

We believe there is merit in reviewing the TNUoS methodology and underlying principles. Clear locational signals are important for efficient network investment. We believe that there is value in medium term reform to improve the existing regime, and potential for fundamental reform of locational charges in coordination with wider market reform.

Could the digitalised Grid Code be brought forward as it would help the industry navigate the vast number of changes?

We are in the first phase of Digitalising the Grid Code where it is important to understand the risks and opportunities of this initiative with stakeholders. Our intention is to progress this project as quickly as possible while ensuring that the programme will best meet industry needs and expectations.

Offshore Transmission Network Review: Discussion

Thank you for your insightful questions, views and challenges in relation to the three illustrative models, the most appropriate way to change codes and standards and how you would like to be engaged on any such changes in future.

These are included in the following slides for information.

We will feed your views into our ongoing work within the Offshore Transmission Network Review and ensure there are further opportunities to engage in future.

If you would like to know more about the Offshore Transmission Network Review and Offshore Coordination:

https://www.gov.uk/government/groups/offshore-transmission-network-review

https://www.nationalgrideso.com/future-energy/projects/offshore-coordination-project

Contact us on:
box.OffshoreCoord@nationalgridESO.com
Or:
Michael.Oxenham1@nationalgrideso.com

Offshore Transmission Network Review: questions and comments

Illustrative Model 1

- Would the offshore substation node be part of the MITS in the TNUoS Model?
- One barrier is the inability to coordinate bids as part of CfD (multi-project bids).
- At the moment interconnectors even when connecting to Scotland don't pay TNUOS, a glaring injustice. When you come to hybrid interconnectors + offshore charging you'll no longer be able to sweep this under the carpet.
- That won't have enormous benefits as adjacent wind farms will peak simultaneously.
- I note GSR011 said max offshore cable capacity 1.32 GW. How on earth do you overcome that ??
- Wouldn't the calculation for the OFTO substation tariffs as it pertains to both wind farms need to change?
- What about taking the two cables separately to shore, then through the same substation?
- Codes don't consider offshore grids - this needs to be addressed asap in order to meet 40GW by 2030 and beyond.
- Is TNUoS is payable by the GB wind farm? How does this work with congestion rents? Is there any value erosion for generator or MPI?
- Would interconnectors that are MPIs pay network charges in this set-up? If not, what is the justification?

Illustrative Model 2

- At the moment interconnectors even when connecting to Scotland don't pay TNUOS, which isn't a level playing field. When you come to hybrid?
- What happens when both countries need the energy simultaneously? A bun fight?
- Eeek - how would the explicit capacity allocation work, and then MRLVC? Would the boundary point be between B and C?
- What would happen with security (eg frequency) across B?
- How do you ensure that capacity is allocated fairly if the full capacity of ABC isn't available?
- What would happen to parasitic load? Flows between wind farms and not touching either country?
- Will it all be DC? If so, how would a totally-DC substation work? If AC, where would it be converted and at what frequency etc.?
- Will it all be DC? If so, how do totally-DC substations work? If AC, where will it be converted, at what frequency (sychronisation) etc.?
- How do you overcome GSR011 saying max cable capacity 1.32 GW?
- This design doesn't really seem to address the onshore radial pt to pt issue?
- GSR011 imposes a 1.32 GW limit on flow along any one offshore cable. Capacity can exceed that but not flow. How does hydrogen piping and offshore?

Offshore Transmission Network Review: questions and comments

Illustrative Model 3

- E parallels the Transmission system. There's a reason why that's not allowed without being MITS.
- Same issues as before: 1. They peak at similar times. 2. Will it be DC and, if so, how will DC substations work? 3. If it's AC, where will the conversion happen and how synchronised?
- This design doesn't really seem to address the onshore radial pt to pt issue?
- The OFTOs will benefit from any increased revenues. The wind farms will lose out if some of their OFTO capacity is taken by others: how will they be compensated?
- Need financially or physically firm access or risk driving up costs for consumers owing to significant risk premiums being baked into CfD bids.
- Could be CfD issues again where individual Phases are associated with particular BMUs with any transfer between offshore substations?

Other Points

- This needs to be coordinated with the EU North Sea offshore network work. How do you propose doing so?
- Needs an empowered strategic code admin that understands TOs and DNOs well enough to know and overcome leccy operation barriers. This has to be ESO (ISO).
- Ensure "delivery of net zero "is an objective of all codes.
- Need to be independently led. If just open governance, only oftos will respond and will be biased.
- Cost to onshore consumers must be highest priority, so SCR would be best.
- The empowered strategic code admin will raise changes across all codes. It will be CA for all codes.
- Work needs to start NOW to ensure we can deliver net zero.
- ISO = independent
- Offshore auctions Scotwind are next month and bidding is blind as to charging. This review is already running VERY late.
- Dedicated stakeholder engagement events, which include BEIS.
- I'm not convinced that the costs and benefits for all parties have been assessed properly, e.g. whether the grids are AC or DC, how it would work, how wind farms are compenstated if they lose cable capacity. Why proceed at this stage?
- You are running behind with the review and Scotwind bids will be blind as to TNUOS.

Storage: Discussion

Discussion, questions, and ESO response

Wouldn't it be a lot cheaper to mandate very fast response to very low frequency in domestic fridges & EV chargers. Need changes in EU eco appliance standards to mandate that fast frequency response in relevant domestic demand. Is storage an expensive way of getting fast frequency response compared to demand side?

Mandating very fast response was considered by ENTSOE as part of implementation of the demand connection code (DCC) c.2014-15 and was subsequently rejected. There are wider issues other than frequency response required to stabilise the grid, including those addressed through grid forming (the ability of converter based plant to behave in a similar way to synchronous generation). This is currently being considered as part of Grid Code modification GC0137 and would extend to all forms of plant including smart loads. This would be technology neutral and an enabler for technology such as smart domestic appliances. Ultimately, this modification is expected to enable the development of a short term stability market and would sit alongside other initiatives such as stability pathfinder, dynamic containment and frequency response.

For very fast services such as Dynamic Containment, the speed of response is required due to it being a post-fault service. As with any provider of this service, demand-side flexibility would need to meet the parameters of the service requirements including in this example, aggregating within a GSP to participate above a minimum 1MW threshold (this requirement is important to allow the control room visibility of whether providers are behind network constraints).

For further information, please refer to the links below:

Dynamic containment Dynamic Containment (nationalgrideso.com)

Grid Forming (GC0137) GC0137: Minimum Specification Required for Provision of GB Grid Forming (GBGF) Capability (formerly Virtual Synchronous Machine/VSM Capability) | National Grid ESO

Stability Pathfinder Network Option Assessment (NOA) Pathfinders | National Grid ESO

Balancing Services Welcome to Balancing Services | National Grid ESO

Storage: Discussion

Is there a need to define duration of storage within the codes? I.e. Would longer duration storage be more or less exposed to Year Round charges in TNUoS? Isn't this more appropriate in the CM, Wholesale market or Balancing Services?

As far as technical codes are concerned (Grid Code) Grid Code Modification GC0096 (Electricity Storage introduced in Jun-20) covers all forms of controllable storage. Further work does however need to be considered with respect to non-controllable storage or those technologies without an active MW component such as synchronous compensators. We continue to work on this issue and are having an ongoing dialogue with BEIS/Ofgem and developers. This issue however extends well beyond technical issues and there are a large number of commercial issues to be discussed. This is ongoing.

We are supportive of a review of the underlying principles and methodology for TNUoS. However, we believe that any review should be undertaken in a holistic manner, considering wider reforms to charges, technical arrangements and networks to ensure that any locational signals deliver consumer benefit. As this review has not yet commenced, we would not be able to comment on the impact this would have on different market participants.

Co-location can deliver value, however the codes lack provision for co-locating storage with offshore generation. The lack of definition/clarity makes investment difficult.

The technical codes allow co-location of offshore generation with offshore storage however we there are licence challenges for OFTOs owning generation/storage. While licence changes are not within the scope of the ESO, we recognise this as an issue and continue to feed into the debate with government.

Please see link to current CUSC Modification for generation sites which comprise multiple technology types within one Power Station and are termed "co-located". This modification will develop a cost-reflective methodology to allow the CUSC charging arrangements to accommodate the growing number of such sites.

CMP316: TNUoS Arrangements for Co-located Generation Sites | National Grid ESO

Storage: Discussion

Is there an option of allowing storage to import in the TNUoS methodology to increase demand in the Year Round background, this could help reduce their network costs?

This change would require a CUSC modification and NGESO are happy to explore the merits of this proposal.

Synthetic inertia isn't the same as real inertia. Synthetic is a very fast response; any response is a delay and a spike on the mains; great for recovering from faults. Real inertia is always-on and prevents the faults occurring in the first place.

We agree that “synthetic inertia” is not a perfect substitute for inertia and have recently announced our new approach to inertia and stability (link below).

Our new approach to inertia and other stability services | National Grid ESO

Consistency and transparency across the whole system (ESO and DNOs). More transparency around DUoS is needed, in particular more breakdown of DNO quotes so that the "residual" element can be identified separately from other charges. A consistent approach between NGESO and DNOs around network stability would also be valuable as each DNO currently has different ANM/Curtailment methodologies. This makes it difficult for investors to understand relative "firmness" of connections and qualification for response services.

The ESO is working with the ENA through the Open Networks programme to facilitate consistency between the ESO and DNOs in service procurement. We are happy to discuss these projects and programmes further. Please feed views in via the upcoming Open Networks Advisory Groups, which take onboard stakeholder feedback to inform the direction of a number of products under Open Networks Work Stream 1A.

Examples of relevant work in Work Stream 1A include: Product 3 which is looking at developing principles to offer improved curtailment choices; Product 5 which is looking at developing a clear and transparent set of rules for dispatching services and managing interaction with ANMs; P6 which is looking at how parties on ANM can possibly trade capacity to reduce the impact of curtailment on their assets; P8 is looking at how curtailment risk on ANM assets can be more equitably spread; and P9 is looking at how the information provided on forecast curtailment can be improved (thus helping customers to understand how ‘firm’ their connection could be).

Storage: Discussion

All distributed systems rely on the grid for back-up, so sufficient capacity is needed on the grid when there is zero distributed generation and distributed storage is exhausted. This means that, above a certain %, distributed generation is a waste of money. What is NG doing to ensure sufficient capacity on the main grid?

In our role as EMR Delivery Body, ESO delivers the Capacity Market (which is a policy determined by government). The Capacity Market aims to ensure the future security of our electricity supply at the lowest cost to consumers.

Recent changes didn't eliminate double charging of storage for grid access: it reduced triple charging to double, because grid access charges and levies are already in the price of the purchased electricity, as well as paid in import and export. When will it be reduced to single charging, to level the playing-field with generation and interconnectors?

Reform of network charging is under way through Ofgem's Targeted Charging Review and will remove these charging distortions. For example, charging of TNUoS and BSUoS to final demand only, will be in place from April 2023.

Licensed storage providers are exempt from paying Final Consumption Levy (FCL) payments.

ESO only considers the energy / balancing from storage, not the other services provided. Inertial storage does so much more, simultaneously. Your current approach is like buying all a car's components: three times as expensive and without its assembly, testing and warranty. Why not buy the complete car? I'm referring to flexible plant.

We are committed to introducing markets and facilitating service stacking to fulfil our ancillary service needs while removing barriers to entry for market parties, to maximise competition and provide the best outcome for end consumers. Bundling services potentially introduces barriers to participation as assets might not be able to provide all the services asked for, which might preclude them from any tender. We consulted on this issue through the System Needs and Product Strategy Consultation, and the overall preference of respondents was for discrete products for each of our system needs. The key concern being that having a single market may introduce too much complexity and would reduce transparency. This is because it would not be possible to identify the value of each individual component of the service, which creates a barrier to new competition and new technologies and transparency in markets was a key preference from the industry.

In addition, regulation has moved towards a requirement for balancing service procurement to day ahead markets. This requires automation through an auction as procurement is so close to delivery and means that there is insufficient time to assess tenders manually, which precludes long term bundled contracts.

Storage: Discussion

Storage creates no new electricity, just moving it in time - much as interconnectors move it in space. They provide grid services (balancing, ancillary, stability etc.), not energy. Therefore should they be regulated similarly, with a definition of storage based on that of interconnectors?

While the ESO is a code party and can raise code modifications through the open governance process like other industry parties, this suggested change would require legislative and/or regulatory changes (which is a matter for Government to address, rather than the ESO).

We have included existing definitions for interconnector and storage in current regulations below for information.

Where is definition found?	Definition
CEP Regulation (EU) 2019/943	*"interconnector" means a transmission line which crosses or spans a border between Great Britain and another country or territory, and which connects the national transmission system of Great Britain with the transmission system of that other country or territory*
Trade and Co-operation Agreement	*"electricity interconnector" means a transmission line: (i) between the Parties, excluding any such line wholly within the single electricity market in Ireland and Northern Ireland; (ii) between Great Britain and the single electricity market in Ireland and Northern Ireland that is outside the scope of point (i);*

Where is definition found?	Definition
CEP Regulation (EU) 2019/943	*"energy storage" means, in relation to the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier;*
CUSC Section 11.3	*"Electricity Storage" is the conversion of electrical energy into a form of energy which can be stored, the storing of that energy, and the subsequent reconversion of that energy back into electrical energy.*

Storage: Discussion

ESO fails to accommodate synchronous storage, which cannot deliver (for example) balancing services without also delivering inertia. If they have a balancing contract but not a stability contract, what do you do?

This will be addressed through the short-term stability market which is planned to follow from GC0137 and stability pathfinders. The current GC0137 specification is available to all plant forms both synchronous and non-synchronous generation as well as other plant types such as smart loads.

To date Pathfinders have allowed both existing plant with existing connections and new assets to participate subject to the additionality criteria of the tender being met. The reason for this is that the pathfinders are used to ‘top up’ what is already provided through the energy market. We believe to date we’ve designed the pathfinder tenders in a way that secure value for the consumer while meeting the operational requirements of the system.

We will also be launching an innovation project to review a broader range of approaches for procuring stability. Once this has launched, we will be inviting views from the industry on this.

General questions

We keep on being invited to get in touch but are never given the way to do so. Same applies to all other sessions. We need contact details of individuals, who will answer, not of box numbers which often don't.

We find that ".box" email addresses can often be helpful in that they allow queries to be addressed across multiple teams, and are sorry to hear that this has been your experience. Below are contact email addresses for the topics that we have covered in this session.

Offshore Transmission Network Review:
Michael.Oxenham1@nationalgrideso.com

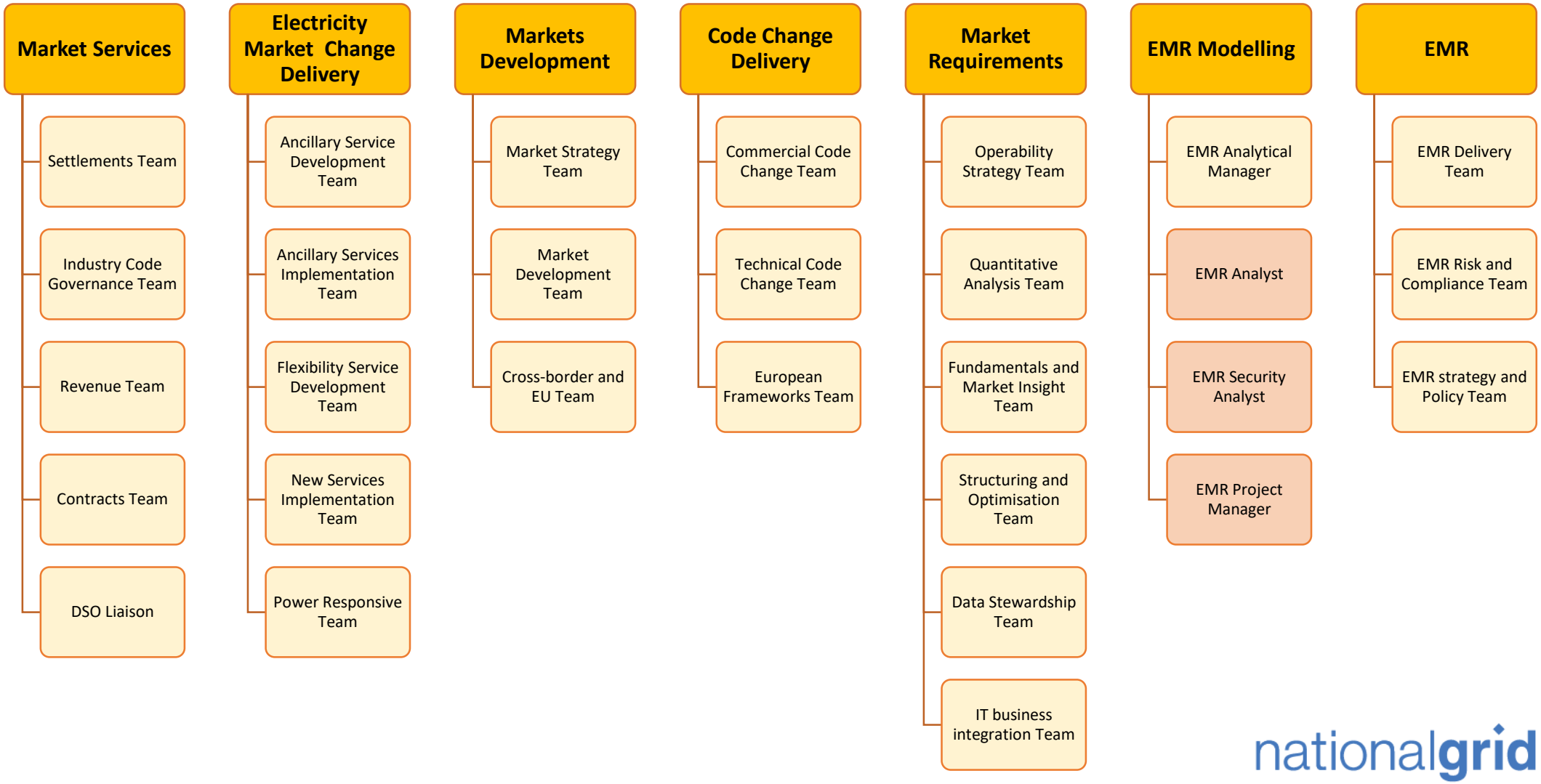
Codes Roadmap and Treatment of storage in the codes:
Mark.Herring2@nationalgrideso.com
Jennifer.doherty@nationalgrideso.com

Can we have an org chart - you all change jobs all the time

An organisational chart with contact details is soon to be published on the NGESO website.

General questions

This organisation chart shows the structure of the Markets team in ESO, who host the Markets Forum events. This chart is up to date at the time of publishing (June 2021).



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